



US Army Corps of Engineers
Institute for Water Resources

“Lessons Learned” in Ecosystem Restoration Planning

***Corps Economics & Environmental Conference
New Orleans, LA
July 16-18, 2002***

Purpose

To describe common...

- problems encountered**
- lessons learned**
- successful practices**

**... from various ecosystem
restoration studies conducted
throughout the Corps.**

Background

- **“Lessons Learned from CE/ICA”**
IWR Report - review of 30+ Corps ecosystem restoration & mitigation studies
 - GI, CAP, & mitigation studies
 - 1994 - present
- **Additional Corps ER & mitigation studies**
- ***Authors' observations & opinions***

Corps Planning Process: Six Steps



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*Lessons related to planning
step #1:*

- Poorly specified objectives
- Objectives not really “ecosystem restoration”
- Objectives not focused on significant resources

Lessons Related to Planning Objectives

- **Poorly specified objectives**
 - **Objectives too vague**
 - *“...to restore aquatic resources...”*
 - *Lesson: should be specific*
 - **Objectives too limiting**
 - *Objective of “maximizing outputs”*
 - *Objective of “minimizing costs”*
 - *Lesson: should be flexible*
 - **Objectives that conflict**
 - *Examples in which non-ecological or “incidental” (e.g., recreation, commercial fishing) benefits drive plan selection*
 - *Lesson: should be congruent*

Lessons Related to Planning Objectives (2)

- Objectives that are not really “ecosystem restoration”
 - Creation of non-indigenous habitat
 - *Example - creation of trout habitat in a naturally warm water fishery*
 - Creation of non-sustaining habitat
 - *Example- only a few miles “restored” because all downstream water consumed by agricultural uses*
- Objectives that are not focused on significant resources
 - Or significance is not explained

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Lessons related to planning step #2:

- Use of ecosystem approaches/models not suited to planning objectives
- Poor selection of “indicator”/output species
- Using multiple outputs, combining outputs
- Successful practices w/ environmental outputs
- Future without project conditions

Lessons Related to Environmental Outputs

- **Use of ecosystem output measurement techniques not suited to planning objectives**
 - **Do outputs selected truly represent planning objectives?**
 - *Example- HEP models selected just because they are known/available, can be run & give an “answer”*
- **Poor selection of “indicator” species or species selected to represent outputs**
 - **Species selected for HEP that do not reflect planning objectives**
 - *If not carefully selected, can result in lower outputs for “with project” than “without project”*
 - *Example - birds chosen for aquatic restoration*

Lessons Related to Environmental Outputs (2)

- **Multiple outputs, combining outputs**
 - May be appropriate, use care
 - How do you do it?
 - How do you conduct CE/ICA?
 - *Lesson: combine & normalize to an index*
 - *Lesson: run CE/ICA separately for each output, then compare results*
 - *Lesson: run CE/ICA on “primary” output, examine effects on “secondary” outputs*

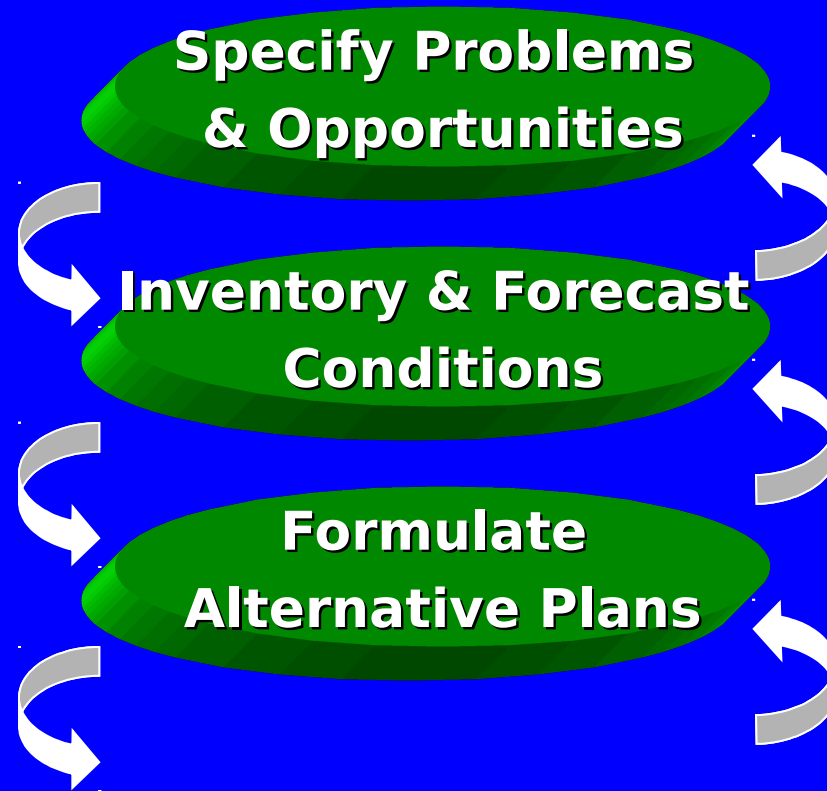
Successful Practices - Environmental Outputs

- Can be “customized”, study-specific
- Handle carefully
- Team effort, seek consensus
- Can embrace multiple characteristics
 - Many examples, such as:
 - *Wetlands functional assessment index: primary productivity, habitat, water quality, erosion buffer, flood buffer, aesthetics*
 - *Sediment functional index: benthic index of biotic integrity, toxicity of surface & subsurface layers, histopathology, sediment quality*
 - *Beach functional index: increase beach, habitat diversity, shore erosion/water quality, sheltered shallow water, downdrift shore starvation*

Lessons Related to Inventory & Forecast

- **Future without project conditions**
 - Don't assume status quo without plausible rationale
 - May lead to under- or over-estimation of benefits
 - *Example: impacts of sea level rise on coastal wetlands*
 - *Lesson: consider future trends, regulations, & likely impacts on resources; document rationale*

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Lessons related to planning step #3:

- Alternatives don't meet 1 or more objectives
- Carrying unsatisfactory alternatives through the analyses
- How many alternatives do you need?
- Consider multiple scales/measures/sites

Lessons Related to Plan Formulation

- **Formulating alternatives that do not meet 1 or more planning objectives**
 - *Then rejecting alt for not meeting objectives*
- **Carrying through the analyses alternatives that do not meet objectives**
 - *Lesson: these alts should be screened out early on*
 - *Lesson: focus on developing more viable alts rather than carrying known losers*

Lessons Related to Plan Formulation (2)

- **How many alternatives do you need?**
 - It depends!
 - *Lesson: consider reasonable number of alternatives*
- **Not considering multiple scales for multiple measures and/or sites**
 - *Lesson: consider multiple scales for measures/sites*
 - *Lesson: a group of sites (all considered at only 1 scale) doesn't really meet the "spirit" of production efficiency*

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Lessons related to planning step #4:

- Issues related to CE/ICA

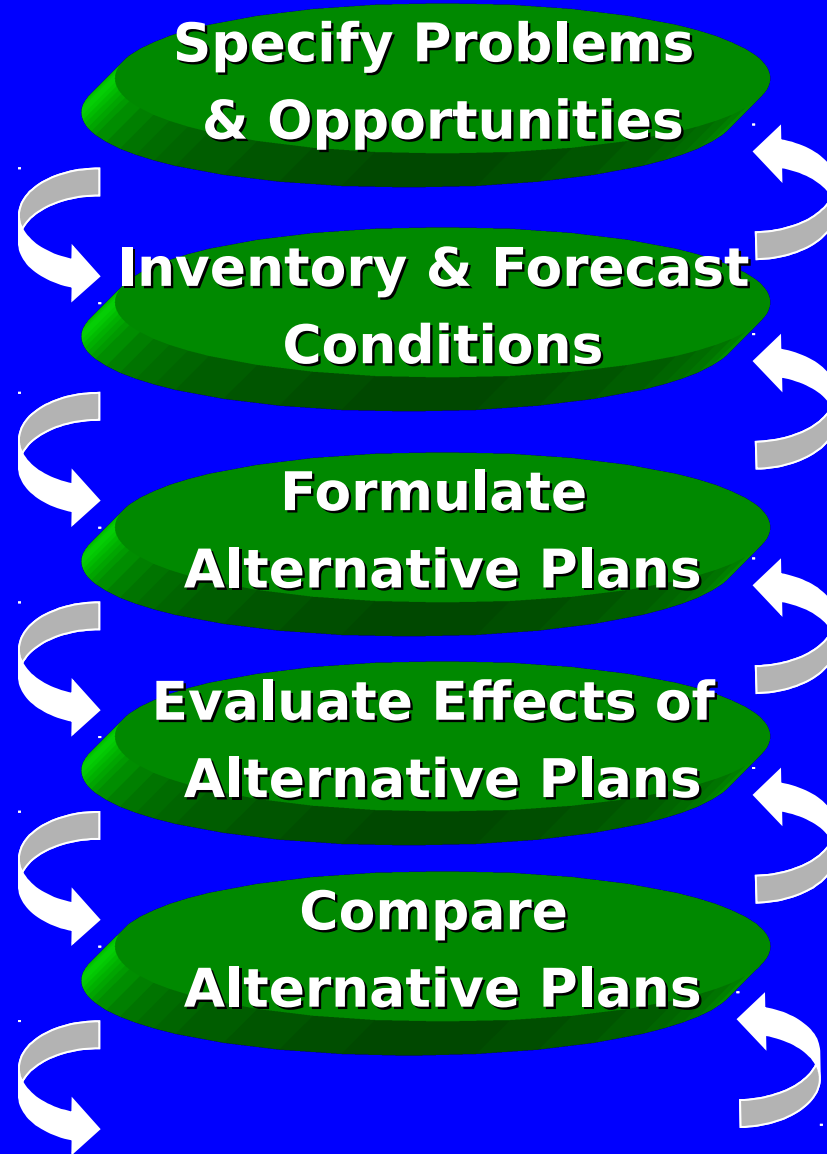
Lessons Related to Evaluation

- **Issues related to CE/ICA**
 - **Not conducting CE/ICA – or in name only**
 - *Example: the difference between with-project and without-project does not constitute ICA !*
 - **Assumption that all sites must be restored – may not be cost effective**
 - *Lesson: do at least CEA at each site; include rationale for inclusion of all sites*
 - *Lesson: preferable to do CE/ICA between sites*

Lessons Related to Evaluation (2)

- **Issues related to CE/ICA**
 - **Analyses that stop with just CEA (cost effectiveness analysis)**
 - *Lesson: do both CEA & ICA (incremental cost analysis) to answer “is it worth it?” question*
 - **Residual uncertainty & confusion related to CE/ICA**
 - **Perception that CE/ICA more difficult to apply to mitigation than restoration**
 - *Lesson: multiple scales & alternatives required for a meaningful CE/ICA*

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Lessons related to planning step #5:

- Successful practices - plan comparison matrix

Successful Practices - Plan Comparison

- **Include plan comparison (“effects”) matrix**
 - **Post-evaluation, array of cost effective or best buy plans**
 - **Can include multiple criteria: institutional, public, & technical significance; acceptability; completeness; effectiveness; efficiency; risk & uncertainty**
 - **Weight criteria**
 - **Rate alternatives based on value for each criterion**
 - **Total score for each alternative plan**

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*Lessons related to
planning step #6:*

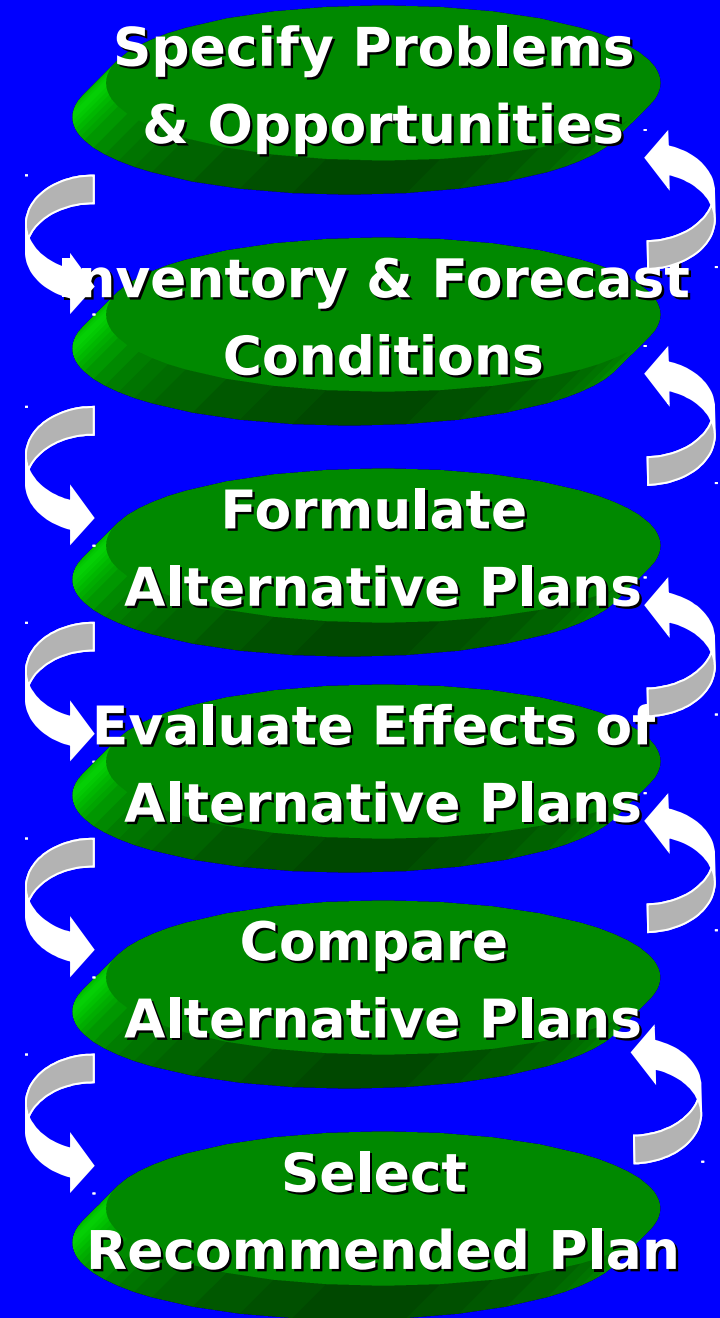
- Selecting alternative
because it:

- maximizes output; has
lowest

- cost; has lowest average
cost;

- no other alt meets objectives

- Selecting a “best buy” plan,
then



Lessons Related to Plan Selection

- **Selecting an alternative solely because it...**
 - **Maximizes total output**
 - *Lesson: possible choice, but must answer “Is it worth it?”*
 - **Has lowest total cost**
 - *Lesson: possible choice, but not looking at larger increments and asking “worth it?”*
 - **Has lowest average cost**
 - *Lesson: possible choice, but guidance says conduct CE/ICA; selected plan not required to have lowest average cost*

Lessons Related to Plan Selection (2)

- **Selecting an alternative because...**
 - **None of the other alternatives carried through analyses met objectives**
 - *Why are there no other viable alternatives?*
 - **In case of mitigation, no others met mitigation target**
 - *Why were no others formulated?*
- **Selecting a best buy plan to implement, then radically altering it**
 - **Example: choosing to implement “55% of a best buy plan”**
 - ***Lesson: selecting a best buy plan is desirable, but smaller cost effective plans are acceptable***

Lessons Related to Plan Selection (3)

- **Why was the recommended alternative preferred to all others?**
 - **Sometimes results of CE/ICA not clear cut**
 - *No breakpoints, targets, cost limits come into play...*
 - *So what other criteria are important? Explain.*
 - **Sometimes results of CE/ICA “unsatisfactory” due to other criteria**
 - *Cost limits, funding constraints, legitimate sponsor concerns*
 - *ER 1105-2-100 provides some flexibility*
- **Tell the story**

Lessons Related to Mitigation

- **Formulation**

- Formulating only 1 plan that meets target

- *Lesson: formulate multiple alternatives that equate to full compensation*

- *Lesson: formulate range of alternatives around a mitigation target*

- **Evaluation**

- CE/ICA not intended to argue for less than full mitigation, but may highlight expensive nature of “final units”

- **Comparison**

- *Rather than developing a mitigation plan solely for the recommended alternative, all alternatives should be compared including required mitigation components & costs*

Miscellaneous Lessons

- **Risk & Uncertainty**
 - Often ignored
 - *Lesson: identify sources of R&U, document assumptions, at a minimum perform sensitivity analyses*
- **Communicate w/ other agencies, offices w/in Corps, public**
 - To better coordinate actions
 - To better explain projects to various audiences
- **Documentation**
 - Missed opportunities to get the “good news” out... “telling the story”
 - *Final report - content & format*
 - *Supplemental materials (CDs, videos, brochures)*

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